

# Velocity - Distance

## Section 7.1 Exercises

In Exercises 1–8, the function  $v(t)$  is the velocity in m/sec of a particle moving along the  $x$ -axis. Use analytic methods to do each of the following:

(a) Determine when the particle is moving to the right, to the left, and stopped.

(b) Find the particle's displacement for the given time interval. If  $s(0) = 3$ , what is the particle's final position?

(c) Find the total distance traveled by the particle.

- $v(t) = 5 \cos t$ ,  $0 \leq t \leq 2\pi$  See page 389.
- $v(t) = 6 \sin 3t$ ,  $0 \leq t \leq \pi/2$  See page 389.
- $v(t) = 49 - 9.8t$ ,  $0 \leq t \leq 10$  See page 389.
- $v(t) = 6t^2 - 18t + 12$ ,  $0 \leq t \leq 2$  See page 389.
- $v(t) = 5 \sin^2 t \cos t$ ,  $0 \leq t \leq 2\pi$  See page 389.
- $v(t) = \sqrt{4 - t}$ ,  $0 \leq t \leq 4$  See page 389.
- $v(t) = e^{\sin t} \cos t$ ,  $0 \leq t \leq 2\pi$  See page 389.
- $v(t) = \frac{t}{1 + t^2}$ ,  $0 \leq t \leq 3$  See page 389.
- An automobile accelerates from rest at  $1 + 3\sqrt{t}$  mph/sec for 9 seconds.

- What is its velocity after 9 seconds?
- How far does it travel in those 9 seconds?

10. A particle travels with velocity

$$v(t) = (t - 2) \sin t \text{ m/sec}$$

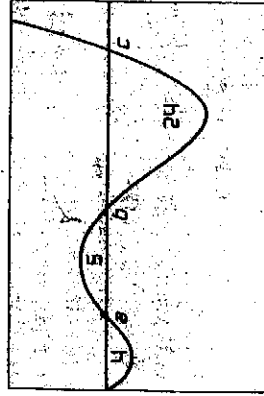
for  $0 \leq t \leq 4$  sec.

- What is the particle's displacement?
- What is the total distance traveled?

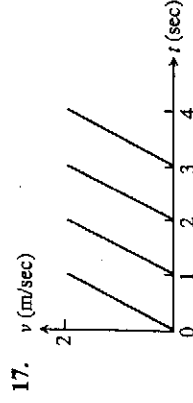
11. **Projectile** Recall that the acceleration due to Earth's gravity is  $32 \text{ ft/sec}^2$ . From ground level, a projectile is fired straight upward with velocity 90 feet per second.

- What is its velocity after 3 seconds?
- When does it hit the ground?
- When it hits the ground, what is the net distance it has traveled?
- When it hits the ground, what is the total distance it has traveled?

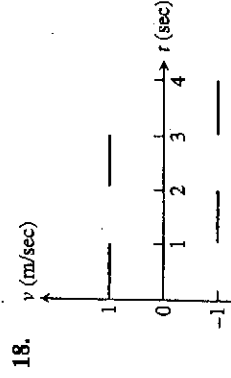
In Exercises 12–16, a particle moves along the  $x$ -axis (units in cm). Its initial position at  $t = 0$  sec is  $x(0) = 15$ . The figure shows the graph of the particle's velocity  $v(t)$ . The numbers are the areas of the enclosed regions.



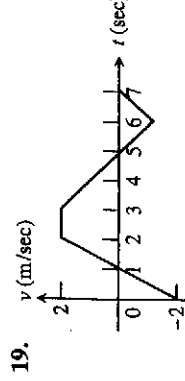
- What is the particle's displacement between  $t = 0$  and  $t = \pi$ ?
  - What is the total distance traveled by the particle in the same time period?
  - Give the positions of the particle at times  $a$ ,  $b$ , and  $c$ .
  - Approximately where does the particle achieve its greatest positive acceleration on the interval  $[0, b]$ ?
  - Approximately where does the particle achieve its greatest positive acceleration on the interval  $[0, c]$ ?
- In Exercises 17–20, the graph of the velocity of a particle moving on the  $x$ -axis is given. The particle starts at  $x = 2$  when  $t = 0$ .
- Find where the particle is at the end of the trip.
  - Find the total distance traveled by the particle.



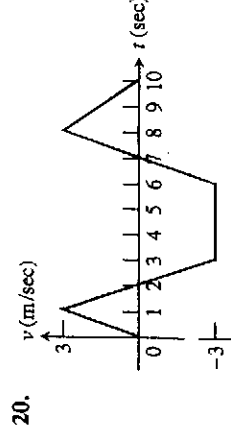
17.  $v$  (m/sec)



18.  $v$  (m/sec)



19.  $v$  (m/sec)



20.  $v$  (m/sec)

- U.S. Oil Consumption** The rate of consumption of oil in the United States during the 1980s (in billions of barrels per year) is modeled by the function  $C = 27.08 \cdot e^{t/25}$ , where  $t$  is the number of years after January 1, 1980. Find the total consumption of oil in the United States from January 1, 1980 to January 1, 1990.  $\approx 332.965$  billion barrels
- Home Electricity Use** The rate at which your home consumes electricity is measured in kilowatts. If your home consumes electricity at the rate of 1 kilowatt-fer 1 hour, you will be charged